

Plasma6.m - Output

Circle1x = Sum of:

```

0.0000000000000 px1^1
0.0000000000000 px1^2
0.0000000000000 px1^3
0.0000000000000 px1^4
0.0000000000000 py1^1
0.0000000000000 py1^2
0.0000000000000 py1^3
0.0000000000000 py1^4
0.0000000000000 pz1^1
0.0000000000000 pz1^2
0.0000000000000 pz1^3
0.0000000000000 pz1^4
0.0000000000000 th1^1
0.0000000000000 th1^2
0.0000000000000 th1^3
0.0000000000000 th1^4
-0.001103403049 th2^1
0.099672504125 th2^2
-2.627659776654 th2^3
19.176291817197 th2^4

```

Test of circle1x:

```

px1 = 2.0000000000000
py1 = 0.0000000000000
pz1 = 0.0000000000000
th1 = 0.0000000000000
th2 = 0.0000000000000
circle1x = 0.0000000000000

```

Circle1y = Sum of:

```

0.0000000000000 px1^1
0.0000000000000 px1^2
0.0000000000000 px1^3
0.0000000000000 px1^4
0.0000000000000 py1^1
0.0000000000000 py1^2
0.0000000000000 py1^3
0.0000000000000 py1^4
0.0000000000000 pz1^1
0.0000000000000 pz1^2
0.0000000000000 pz1^3

```

```

0.000000000000 pz1^4
0.000000000000 th1^1
0.000000000000 th1^2
0.000000000000 th1^3
0.000000000000 th1^4
-0.000000005856 th2^1
0.000000528980 th2^2
-0.000013945462 th2^3
0.000101772024 th2^4

```

Test of circlely:

```

px1 = 2.000000000000
py1 = 0.000000000000
pz1 = 0.000000000000
th1 = 0.000000000000
th2 = 0.000000000000
circlely = 0.000000000000

```

Circle1z = Sum of:

```

-231.604609019645 px1^1
16681.794346619816 px1^2
-296858.897848765190 px1^3
1427991.523731668700 px1^4
7855.602810731285 py1^1
-123389.911890103540 py1^2
678336.313875550640 py1^3
-1522096.475221691400 py1^4
83.016118028096 pz1^1
-6309.224970135336 pz1^2
127844.821763269330 pz1^3
-804924.280400442080 pz1^4
70.041685233352 th1^1
-6303.753214785179 th1^2
128876.846675594890 th1^3
-806883.266290542900 th1^4
46.694484022162 th2^1
-4202.504665397654 th2^2
109825.526092629910 th2^3
-776998.841788560380 th2^4

```

Test of circle1z:

```

px1 = 2.000000000000
py1 = 0.000000000000
pz1 = 0.000000000000
th1 = 0.000000000000

```

```
th2 = 0.000000000000
circle1z = 1798296.137096921000
```

```
toruseqlx = Sum of:
```

```

0.0000000000003 Rtt^1
-0.0000000007262 Rtt^2
0.0000000446807 Rtt^3
0.0000001140260 Rtt^4
0.0000000000000 Otxt^1
0.0000000000000 Otxt^2
-0.0000000000000 Otxt^3
-0.0000000000000 Otxt^4
0.0000000000000 Otyt^1
0.0000000000000 Otyt^2
-0.0000000000000 Otyt^3
-0.0000000000000 Otyt^4
0.0000000000000 Otzt^1
-0.0000000000000 Otzt^2
-0.0000000000000 Otzt^3
0.0000000000000 Otzt^4
-0.0000000000928 pxlt^1
0.0000000224558 pxlt^2
-0.0000008106375 pxlt^3
0.000062831831 pxlt^4
-0.0000000000000 pylt^1
0.0000000000000 pylt^2
-0.0000000000000 pylt^3
0.0000000000000 pylt^4
-0.0000000000000 pzlt^1
0.0000000000000 pzlt^2
-0.0000000000000 pzlt^3
0.0000000000000 pzlt^4
-0.0000000000000 Thtt^1
0.0000000000000 Thtt^2
-0.0000000000000 Thtt^3
0.0000000000000 Thtt^4
-0.0000000000000 Thtnt^1
0.0000000000000 Thtnt^2
-0.0000000000000 Thtnt^3
0.0000000000000 Thtnt^4
```

```
Test of toruslx
```

```

Rtt = 5.000000000000
Otx = 0.000000000000
Oty = 0.000000000000
Otz = 0.000000000000
```

```
pxlt = 0.000000000000
pylt = 0.000000000000
pzlt = 0.000000000000
Thtt = 0.000000000000
Thtnt = 0.000000000000
toruslx = 0.000143868084
```

Test of toruslx

```
Rtt = 5.000000000000
Otx = 0.000000000000
Oty = 0.000000000000
Otz = 0.000000000000
pxlt = 10.000000000000
pylt = 0.000000000000
pzlt = 0.000000000000
Thtt = 0.000000000000
Thtnt = 0.000000000000
toruslx = 0.000143868084
```

Test of toruslx

```
Rtt = 5.000000000000
Otx = 0.000000000000
Oty = 0.000000000000
Otz = 0.000000000000
pxlt = 0.000000000000
pylt = 0.000000000000
pzlt = 10.000000000000
Thtt = 0.000000000000
Thtnt = 0.000000000000
toruslx = 0.000143868084
```

Test of toruslx

```
Rtt = 5.000000000000
Otx = 0.000000000000
Oty = 0.000000000000
Otz = 0.000000000000
pxlt = -10.000000000000
pylt = 0.000000000000
pzlt = 0.000000000000
Thtt = 0.000000000000
Thtnt = 0.000000000000
toruslx = 0.000143868084
```

Test of toruslx

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =     0.000000000000
pylt =     0.000000000000
pzlt =    -10.000000000000
Thtt =     0.000000000000
Thtnt =    0.000000000000
toruslx =   0.000143868084

```

toruseqly = Sum of:

```

0.0000000000003 Rtt^1
-0.0000000008138 Rtt^2
0.000000455178 Rtt^3
0.000001320391 Rtt^4
0.000000000549 Otxt^1
0.000000000000 Otxt^2
-0.000002283051 Otxt^3
-0.000000000000 Otxt^4
0.000000000549 Otyt^1
0.000000000000 Otyt^2
-0.000002283051 Otyt^3
-0.000000000000 Otyt^4
0.000000000549 Otzt^1
0.000000000000 Otzt^2
-0.000002283051 Otzt^3
-0.000000000000 Otzt^4
0.000000000227 pxlt^1
-0.000000054931 pxlt^2
0.000001982961 pxlt^3
-0.000015369761 pxlt^4
0.000000000000 pylt^1
-0.000000000000 pylt^2
0.000000000000 pylt^3
-0.000000000000 pylt^4
0.000000000000 pzlt^1
-0.000000000000 pzlt^2
0.000000000000 pzlt^3
-0.000000000000 pzlt^4
0.000000000000 Thtt^1
-0.000000000000 Thtt^2
0.000000000000 Thtt^3
-0.000000000000 Thtt^4
0.000000000000 Thtnt^1
-0.000000000000 Thtnt^2
0.000000000000 Thtnt^3

```

-0.000000000000 Thtnt^4

Test of torusly

Rtt = 5.000000000000
 Otx = 0.000000000000
 Oty = 0.000000000000
 Otz = 0.000000000000
 pxlt = 0.000000000000
 pylt = 0.000000000000
 pzlt = 0.000000000000
 Thtt = 0.000000000000
 Thtnt = 0.000000000000
 torusly = 0.000000000764

Test of torusly

Rtt = 5.000000000000
 Otx = 0.000000000000
 Oty = 0.000000000000
 Otz = 0.000000000000
 pxlt = 10.000000000000
 pylt = 0.000000000000
 pzlt = 0.000000000000
 Thtt = 0.000000000000
 Thtnt = 0.000000000000
 torusly = 0.000000000764

Test of torusly

Rtt = 5.000000000000
 Otx = 0.000000000000
 Oty = 0.000000000000
 Otz = 0.000000000000
 pxlt = 0.000000000000
 pylt = 0.000000000000
 pzlt = 10.000000000000
 Thtt = 0.000000000000
 Thtnt = 0.000000000000
 torusly = 0.000000000764

Test of torusly

Rtt = 5.000000000000
 Otx = 0.000000000000
 Oty = 0.000000000000
 Otz = 0.000000000000
 pxlt = -10.000000000000

```

pylt =      0.000000000000
pzlt =      0.000000000000
Thtt =      0.000000000000
Thtnt =     0.000000000000
torusly =    0.000000000764

```

Test of torusly

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =      0.000000000000
pylt =      0.000000000000
pzlt =     -10.000000000000
Thtt =      0.000000000000
Thtnt =     0.000000000000
torusly =    0.000000000764

```

toruseqlz = Sum of:

```

-0.000000322267 Rtt^1
 0.000850918052 Rtt^2
-0.052350609154 Rtt^3
-0.133599811766 Rtt^4
-0.000000000000 Otxt^1
-0.000000000000 Otxt^2
 0.000000000046 Otxt^3
 0.000000000000 Otxt^4
-0.000000000000 Otyt^1
-0.000000000000 Otyt^2
 0.000000000046 Otyt^3
 0.000000000000 Otyt^4
-0.000000000000 Otzt^1
-0.000000000000 Otzt^2
 0.000000000046 Otzt^3
 0.000000000000 Otzt^4
 0.000108721626 pxlt^1
-0.026310633477 pxlt^2
 0.949792124209 pxlt^3
-7.361758735635 pxlt^4
 0.000000000000 pylt^1
-0.000000000000 pylt^2
 0.000000000004 pylt^3
-0.000000000031 pylt^4
 0.000000000000 pzlt^1
-0.000000000000 pzlt^2
 0.000000000000 pzlt^3

```

```

-0.000000000000 pzlt^4
 0.000000000000 Thtt^1
-0.000000000000 Thtt^2
 0.000000000000 Thtt^3
-0.000000000000 Thtt^4
 0.000000000000 Thtnt^1
-0.000000000000 Thtnt^2
 0.000000000000 Thtnt^3
-0.000000000000 Thtnt^4

```

Test of torus1z

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =     0.000000000000
pylt =     0.000000000000
pzlt =     0.000000000000
Thtt =     0.000000000000
Thtnt =    0.000000000000
torus1z =   -16.856458143628

```

Test of torus1z

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =     10.000000000000
pylt =     0.000000000000
pzlt =     0.000000000000
Thtt =     0.000000000000
Thtnt =    0.000000000000
torus1z =   -16.856458143628

```

Test of torus1z

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =     0.000000000000
pylt =     0.000000000000
pzlt =     10.000000000000
Thtt =     0.000000000000
Thtnt =    0.000000000000
torus1z =   -16.856458143628

```

Test of torus1z

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =     -10.000000000000
pylt =      0.000000000000
pzlt =      0.000000000000
Thtt =      0.000000000000
Thtnt =     0.000000000000
torus1z =   -16.856458143628

```

Test of torus1z

```

Rtt =      5.000000000000
Otx =      0.000000000000
Oty =      0.000000000000
Otz =      0.000000000000
pxlt =      0.000000000000
pylt =      0.000000000000
pzlt =     -10.000000000000
Thtt =      0.000000000000
Thtnt =     0.000000000000
torus1z =   -16.856458143628

```

multitorus1x = Sum of:

```

0.000000000000 Rmt^1
-0.000000000000 Rmt^2
0.000000001428 Rmt^3
0.000000000001 Rmt^4
-0.000000000263 Rt^1
0.000000068457 Rt^2
-0.000005897802 Rt^3
0.000193784933 Rt^4

```

Test of multitorus1x

```

Rt =      20.000000000000
Rmt =     100.000000000000
multitorus1x =      0.003825357561

```

multitorus1y = Sum of:

```

0.000000000000 Rmt^1
-0.000000000020 Rmt^2

```

```

0.000000192180 Rmt^3
0.000000000124 Rmt^4
-0.000000035429 Rt^1
0.000009211495 Rt^2
-0.000793605735 Rt^3
0.026075617006 Rt^4

```

Test of multitorusly

```

Rt = 20.000000000000
Rmt = 100.000000000000
multitorusly = 0.273995349076

```

multitoruslz = Sum of:

```

-0.000000000000 Rmt^1
0.000000017288 Rmt^2
-0.000167200594 Rmt^3
-0.000000107566 Rmt^4
0.000030823804 Rt^1
-0.008014189021 Rt^2
0.690453207930 Rt^3
-22.686319689119 Rt^4

```

Test of multitoruslz

```

Rt = 20.000000000000
Rmt = 100.000000000000
multitoruslz = -447.832981790899

```

disB =

disB = 447.833065625812

```

disVec = 1/4722366482869645213696*(3925789059813502246324517062562
5*plrad2^2*cos(1/4/plrad)^2+22300745198530623141535718272648361505
980416*(1125899906841633/1125899906842624*plrad2*cos(1/4/plrad)-11
25899906841633/1125899906842624*plrad)^2+2230074519853062314153571
8272648361505980416*plrad2^2*sin(1/4/plrad)^2)^(1/2)
thbp = acos(191561942608236107294793378393788647952342390272950272
*(6908364823126855828376204034825/13611294676837538538534984297270
72845824*plrad2*cos(1/4/plrad)+(4733298996783135/40564819207303340
847894502572032*Rmt^4-6149644317199337/309485009821345068724781056
*Rmt^3+907544754150167/4722366482869645213696*Rmt^2+11957336157832
69/9671406556917033397649408*Rmt-1338463258370603/3777893186295716
1709568*Rt^4+2718753493565289/295147905179352825856*Rt^3-731972094
4214253/9223372036854775808*Rt^2+7515784898077167/2882303761517117
44*Rt)*(1125899906841633/1125899906842624*plrad2*cos(1/4/plrad)-11
25899906841633/1125899906842624*plrad)-984795141561383/21990232555

```

```

52*plrad2*sin(1/4/plrad))/(231684107270866122340929437336125751554
5788416*Rmt^3*Rt^4-60237867890425228505226662112422400304100042342
4*Rmt^3*Rt^3+51897240028674137917575981430594577391838335860736*Rm
t^3*Rt^2+3537313949852486976855409453041163865948160*Rmt^4*Rt^3-12
567469091995526583306253908422849895619100672*Rmt^5-13605053653278
787776703014444171987517440*Rmt^4*
Rt^4-7630515149779167885738784792640225280*Rmt^7+72350967624388910
4647293418622104136318976*Rmt^6-3047532018334455891144399149787242
49065226240*Rmt^4*Rt^2+1001331948881325514491692405227003313286807
5520*Rmt^4*Rt-1705195029513586128153599089148768346291621203017728
*Rmt^3*Rt-322907908257925978314161782427595875139106293940224*Rmt*
Rt^2+10609831271331899061823998213071769781048153422692352*Rmt*Rt+
5825961029994848386101474949185655959970606454145024*Rmt^2*Rt^3-50
1928950276480163383577650155381764616986235435483136*Rmt^2*Rt^2-27
098576822050184986625440085458506298641585659430567936*Rt^5+232155
490457197823648596806818617297315288263627374592*Rt^6+206544030655
8695978309808011960279544599500816384*Rt^8-10740289594105225630137
63415705623697108646391447552*Rt^7+3748038220850919680456866440241
410694191268233216*Rmt*Rt^3-14415531618657374604508264055604704006
681657344*Rmt*Rt^4+16491951223370133218850002511239538781351475932
381052928*Rmt^2*Rt-22407542423057095526759085065689282556540345122
816*Rmt^2*Rt^4+2240411939294823223
5078220428225*Rmt^8+1118840752301634425452280657589570861551773743
388277317042176*Rt^2-681033501400991947800118085672583329707195120
28327102644224*Rt^3+1826840642345046269380801957220402195203637797
112575426560*Rt^4+25152936057826104251979479515669715721650176*Rmt
^2+78195587466329545339466946826661100894109564928*Rmt^3+607737111
85180079180293747908762384513272819744768*Rmt^4+330013145613248666
677678189851051839429103330952322885758172541222912)^(1/2)/(392578
90598135022463245170625625*plrad2^2*cos(1/4/plrad)^2+2230074519853
0623141535718272648361505980416*(1125899906841633/1125899906842624
*plrad2*cos(1/4/plrad)-1125899906841633/1125899906842624*plrad)^2+
22300745198530623141535718272648361505980416*plrad2^2*sin(1/4/plra
d)^2)^(1/2))
projMt = 4722366482869645213696*(6908364823126855828376204034825/1
361129467683753853853498429727072845824*plrad2*cos(1/4/plrad)+(473
3298996783135/40564819207303340847894502572032*Rmt^4-6149644317199
337/309485009821345068724781056*Rmt^3+907544754150167/472236648286
9645213696*Rmt^2+1195733615783269/9671406556917033397649408*Rmt-13
38463258370603/37778931862957161709568*Rt^4+2718753493565289/29514
7905179352825856*Rt^3-7319720944214253/9223372036854775808*Rt^2+75
15784898077167/288230376151711744*Rt)*(1125899906841633/1125899906
842624*plrad2*cos(1/4/plrad)-1125899906841633/1125899906842624*plr
ad)-984795141561383/2199023255552*plrad2*sin(1/4/plrad))/(39257890
598135022463245170625625*plrad2^2*cos(1/4/plrad)^2+223007451985306
23141535718272648361505980416*(1125899906841633/1125899906842624*p
lrad2*cos(1/4/plrad)-1125899906841633/1125899906842624*plrad)^2+22
300745198530623141535718272648361505980416*plrad2^2*sin(1/4/plrad)

```

$$^2)^{(1/2)}$$

plasmatorus1 = Sum of:

```

    0.000000062948 Rt^1
   -0.000017467265 Rt^2
    0.001564144255 Rt^3
   -0.052494080787 Rt^4
   -0.000000000000 Rmt^1
    0.000000000466 Rmt^2
   -0.000000400206 Rmt^3
    0.000035661511 Rmt^4

```

plasmatorusdiff3 = Sum of:

```

  117.440705221834 plasmatorusdiff3Rt^1
   62.078165333052 plasmatorusdiff3Rt^2
   28.596341671524 plasmatorusdiff3Rt^3
  563.099392738475 plasmatorusdiff3Rmt^1
  563.099392738475 plasmatorusdiff3Rmt^2
   48.487747771337 plasmatorusdiff3Rmt^3

```

Minimum of Plasmatorus Eq Occurs At:

```

minRt =      117.440705221834
minRtm =     563.099392738475

```

plasmatorusm = Sum of:

```

    0.000000062948 Rt^1
   -0.000017467265 Rt^2
    0.001564144255 Rt^3
   -0.052494080787 Rt^4
   -0.000000000000 Rmt^1
    0.000000000466 Rmt^2
   -0.000000400206 Rmt^3
    0.000035661511 Rmt^4

```

Table of Minimum B Field Due to Various Radius Sizes and Number of Toruses

```

Ring Size 1 =      1.000000000000
Ring Size 2 =     10.000000000000
Ring Size 3 =     40.000000000000
# of Rings 1 =      10
# of Rings 2 =      10
minB =      -0.384548996191

```

```
fperA =      -151.813602146415

curl =      1.000000000000
cur2 =      1.000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      1.000000000000
Ring Size 2 =      10.000000000000
Ring Size 3 =      40.000000000000
# of Rings 1 =      10
# of Rings 2 =      11
minB =      -0.384548996191
fperA =      -151.813602146415

curl =      1.000000000000
cur2 =      1.000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      1.000000000000
Ring Size 2 =      10.000000000000
Ring Size 3 =      40.000000000000
# of Rings 1 =      11
# of Rings 2 =      10
minB =      -0.384548996191
fperA =      -151.813602146415

curl =      1.000000000000
cur2 =      1.000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      1.000000000000
Ring Size 2 =      10.000000000000
Ring Size 3 =      40.000000000000
# of Rings 1 =      11
# of Rings 2 =      11
minB =      -0.384548996191
fperA =      -151.813602146415

curl =      1.000000000000
cur2 =      1.000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      2.000000000000
Ring Size 2 =      10.000000000000
```

```
Ring Size 3 =      40.0000000000000
# of Rings 1 =      10
# of Rings 2 =      10
minB =      -0.384548996191
fperA =     -303.627204292831

curl =      1.0000000000000
cur2 =      1.0000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      2.0000000000000
Ring Size 2 =     10.0000000000000
Ring Size 3 =     40.0000000000000
# of Rings 1 =      10
# of Rings 2 =      11
minB =      -0.384548996191
fperA =     -303.627204292831

curl =      1.0000000000000
cur2 =      1.0000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      2.0000000000000
Ring Size 2 =     10.0000000000000
Ring Size 3 =     40.0000000000000
# of Rings 1 =      11
# of Rings 2 =      10
minB =      -0.384548996191
fperA =     -303.627204292831

curl =      1.0000000000000
cur2 =      1.0000000000000
Temperature1 =      0.000327408284
Pressure1 =      0.000000518335

Ring Size 1 =      2.0000000000000
Ring Size 2 =     10.0000000000000
Ring Size 3 =     40.0000000000000
# of Rings 1 =      11
# of Rings 2 =      11
minB =      -0.384548996191
fperA =     -303.627204292831

curl =      1.0000000000000
cur2 =      1.0000000000000
Temperature1 =      0.000327408284
```

Pressure1 = 0.000000518335